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THE MELON APHID.

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BULLETIN 326

THE MELON APHID.[1]

(*Aphis gossypii* Glover)

EDITH M. PATCH

There are about one hundred and fifty titles in the writer's list of references to economic publications on the melon aphid, and the list is not complete. Besides the literature on this insect from the United States and Canada, there are accounts of its serious depredations from such widely separated places as England, Hawaiian Islands, Holland, India, Japan, Java, Philippine Islands, Porto Rico, Russia, South Africa, and many others.

There would be little need, at the present time, to add to the list of economic papers already published, were it not for one circumstance. The source of annual infestation by this aphid has not previously been known. In whatever country this species lives, its winged forms suddenly appear each year upon various cucurbits (melons, squashes, cucumbers), and establish large and vigorous colonies which often greatly damage these crops. Later in the season, winged forms leave the cucurbits for some destination which has been a mystery.

It is obviously desirable to know the entire annual cycle of any injurious insect, in order to take advantage of its most vulnerable points with reference to economic control. For this reason the writer attempted to ascertain whence the melon aphid comes and whither it goes. The experimental work on which this bulletin is based has extended through three seasons. Such details of this study as are of a technical nature have been reserved for a separate publication as a discussion of them is not essential to the purpose of the present bulletin.

The present bulletin is a record of the seasonal activities of the melon aphid, with especial reference to its occurence on orpine (live-forever) which, the writer has found, serves as the primary food plant. In this bulletin is also assembled such other information as seems to have most bearing on the economic aspects of the problem.

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[1]Papers from the Maine Agricultural Experiment Station: Entomology No. 118.

SEASONAL HISTORY

The following outline of the seasonal history of the melon aphid is based exclusively on the writer's observation of this species in Maine. What essential modifications will be found to occur in other localities, it yet remains to be ascertained. The melon aphids pass the winter as eggs which are deposited on orpine or live-forever *(Sedum purpureum)* in September. The eggs hatch in the spring; and the first generations, feeding on the orpine, are wingless females. Indeed, wingless females may be found all summer upon these plants.

In June, winged females appear, in addition to the wingless ones. These winged forms leave the colonies in which they have developed and seek uninfested plants on which to establish new colonies. For this purpose, these early winged forms accept vigorously growing shoots of orpine, each settling on the under side of a young leaf near the tip of the shoot. The progeny of the winged female settle among the terminal leaves and on the tender stem of the growing shoot.

Winged forms develop continuously in these colonies on the orpine and disperse to uninfested plants for the establishment of new colonies. Early in the summer the winged aphids seem to prefer to settle on clean and healthy orpine; but those developing later accept other species of plants, also. (A list of food plants is given on page 188).

About the time melon, squash, and cucumber plants begin to run, they prove attractive to the winged aphids and the succeeding generations soon colonize the under side of the leaves. Under favorable weather conditions, these aphids may become mature when eight days old; and thus within a few weeks the infestation may be very severe indeed.

On the cucurbits, both wingless and winged females develop, the wingless ones being far more numerous until late in the season. As fall approaches the proportion of the winged forms increases and by the time frost comes there are comparatively few wingless ones remaining on the vines.

The winged aphids fly away from the colonies in which they develop and seek fresh vegetation. Under laboratory conditions, the winged forms from cucurbits accept growing orpine plants and there would seem to be no reason to think that they will not

accept the same vegetation when they are in the open. The colonies established on orpine by the winged females flying from cucurbits contain at first wingless females only. Later, winged females are also produced.

All of the forms mentioned so far in this account, whether winged or wingless, are viviparous females (forms producing living young). No other forms occur on the cucurbits or other secondary food plants.

On the primary food plant, the orpine, however, there develop in September, wingless egg-laying females. At the same time on the same plant, the males (also wingless) become mature. Both the egg-laying females and the males are produced by wingless females.

The eggs deposited by the females on the orpine are at first yellow, later turning black. Since these eggs do not hatch until the succeeding spring they serve as the overwintering stage of this insect.

As has been stated in a previous paragraph there are still wingless viviparous females remaining on the cucurbits (and other secondary food plants) at the time of killing frosts. If such females are brought into a warmed building and supplied with suitable vegetation, they and their progeny can maintain successive generations of viviparous females for many months. No males or egg-laying females occur in such colonies. In climates where growing plants are continuously available, there would seem to be no reason why the melon aphid cannot persist for long periods without the intervention of the egg stage on orpine.

It is quite possible that there are localities where this species is carried over from season to season both by the egg stage and by viviparous females.

In the regions of cold winters, however, such an aphid can live from fall to spring only in the egg stage, except for such colonies as chance to be harbored in greenhouses or on house plants.

The circumstance that the melon aphid has a world-wide record as a pest on cucurbits, indicates that such plants are among the summer favorites. Cucurbits, or other secondary food plants, however, are not necessary to the life cycle of the melon aphid. This species can maintain itself exclusively upon the orpine all

summer if there are plenty of healthy growing shoots available. Under laboratory conditions the writer has kept the successive wingless generations on orpine from spring until September when the males and egg laying females appeared at practically the same time that the same forms were developing on orpine out of doors.

FOOD PLANTS OF THE MELON APHID

(Maine Records)

Lists comprising the names of many species of plants, reported to be acceptable to the melon aphid, have been published by entomologists from time to time. The present list is concerned only with plants in Maine on which colonies of the melon aphid have been seen feeding in a normal manner; sample specimens in every instance having been examined, under a microscope, by the writer. The plants which are marked with an asterisk are those on which the writer has reared the melon aphid under experimental conditions. No plant is included unless individual aphids are known to have fed upon it from birth to maturity. All the records in this list are from observations in Maine during 1923, 1924 and 1925. Certain of the plants listed, not native to Maine, were greenhouse plants or plants grown from seeds secured from other parts of the country.

WATER-PLANTAIN FAMILY

*Arrow-head, *Sagittaria latifolia,* Willd.

LILY FAMILY

*Asparagus, *Asparagus officinalis,* Linn.

BUCKWHEAT FAMILY

Dock, *Rumex crispus,* Linn.
Field sorrel, *Rumex Acetosella,* Linn.

GOOSEFOOT FAMILY

*Common pigweed, *Chenopodium album,* Linn.

Pink Family

*Common chickweed, *Stellaria media,* Smith
Spurry, *Spergula arvensis,* Linn.

Purslane Family

*Common purslane, *Portulaca oleracea,* Linn.

Mustard Family

*Mustard, *Brassica*
*Shepherd's purse, *Capsella Bursa-pastoris,* Moench

Orpine Family

*Common orpine or Live-forever, *Sedum purpureum* Tausch.

Saxifrage Family

*Mock orange, *Philadelphus coronarius,* Linn.

Rose Family

*Japan quince, *Pyrus Japonica,* Thunb.
*Strawberry, *Fragaria Chiloensis,* Duchesne

Pulse Family

*Alfalfa, *Medicago sativa,* Linn.
Red clover, *Trifolium pratense,* Linn.
*Sweet clover, *Melilotus alba,* Lam.
*Scarlet runner bean, *Phaseolus multiflorus,* Willd

Rue Family

*Orange, *Citrus Aurantium,* Linn.

Mallow Family

*Common cotton, *Gossypium herbaceum,* Linn.
*Common mallow, *Malva rotundifolia,* Linn.
*European mallow, *Malva Alcea,* Linn.

Begonia Family

*Begonia, *Begonia semperflorens,* Link and Otto.

Evening Primrose Family

*Common evening primose, *Oenothera biennis,* Linn.

PARSLEY FAMILY

*Celery, *Apium graveolens,* Linn.

PRIMROSE FAMILY

*Loosestrife, *Lysimachia stricta,* Ait.

CONVOLVULUS FAMILY

*Hedge bindweed, *Convolvulus sepium,* Linn.

VERVAIN FAMILY

*Callicarpa, *Callicarpa purpurea,* Juss.
*Clerodendron, *Clerodendron Thomsonae,* Balf.
*Vervain, *Verbena bracteosa,* Michx.

MINT FAMILY

*Ground ivy, *Nepeta hederacea,* Trevisan.
Salvia, *Salvia splendens,* Sellow

NIGHTSHADE FAMILY

*Jamestown weed, *Datura Stramonium,* Linn.
*Potato, *Solanum tuberosum,* Linn.

FIGWORT FAMILY

Speedwell, *Veronica officinalis,* Linn.
Veronica serpyllifolia, Linn.

PLANTAIN FAMILY

Common plantain, *Plantago major,* Linn.
*Narrow-leaved plantain, *Plantago lanceolata,* Linn.

GOURD FAMILY

Cucumber, *Cucumis sativus,* Linn.
Hubbard squash, *Cucurbita maxima,* Duchesne.
Muskmelon, *Cucumis Melo,* Linn.
Summer crookneck squash, *Cucurbita Pepo,* Linn.

COMPOSITE FAMILY

*Beggar's tick, *Bidens frondosa,* Linn.
Cultivated aster
*Fall dandelion, *Leontodon autumnale,* Linn.
Groundsel, *Senecio vulgaris,* Linn.

A species of insect which, under experimental conditions will feed upon certain plants to the extent of developing an entire generation, will presumably accept these same plants in the open, under favorable conditions. The fact that the melon aphid can be reared upon representatives of 25 or more different plant families, however, does not necessarily indicate that this insect is an economic pest upon members of all these families. In fact, members of three families only, seem to have suffered seriously enough to bring this aphid into economic prominence. On many of the plants included in this present list, the aphids established only small colonies of small individuals.

Cucumbers, melons, squashes, in the Gourd Family; cotton okra, and some others, in the Mallow Family; oranges in the Rue Family; all are subject to severe infestation by the melon aphid.

Obviously, feeding records covering only three seasons in one locality will not comprise a total list of food plants of this insect of world-wide distribution. It will suffice, however, to indicate that it may be met on a wide range of unrelated plants.

Of all the plants in the 25 families listed, apparently the orpine, alone, is accepted as its overwintering host plant in Maine. As this is the plant on which its egg stage is passed, it fulfils the requirements of the primary food plant. All others in the list are but secondary, summer food plants.

General Appearance of the Melon Aphid

The colonies of the melon aphids present a motley appearance when these insects are crowded together on the underside of a leaf. Among the wingless viviparous females, the colors may range from pale green to greenish black, or from nearly white to lemon yellow. Their bodies are dull because of a slight "bloom" of waxy powder, unless they have recently molted when they may be shiny. The two short basal segments of the antennae are dusky. The third, fourth and part of the fifth segments are whitish, and the sixth is dusky. The legs are whitish, with tibial tips and feet black. The entire cornicles are black. The cauda is slightly dusky to nearly black, but never the jet-black of the cornicles. The anal plate is dusky to black. The wingless females vary greatly in size. In total body length, exclusive of antennae, a large individual may be 2 mm. and a small one 1 mm.

The young with wing pads, in the last instar before attaining wings, has the head and prothorax dusky; the rest of the thorax is pale green with dark wing pads; the basal half of the abdomen is light tan to greenish brown and the caudal half (including segment with cornicles) is dark green. The whole body is dull and the abdomen is spotted with white wax areas.

The winged female has a shiny body. The head, antenna, and thoracic lobes are black; the abdomen has two color areas, the basal half being tan to brownish green and the caudal half green.

All of the foregoing forms and colors may be present on a single leaf. Some colonies, however, comprise chiefly green or entirely yellow wingless forms.

On the orpine the apterous mother of the true sexes (the males and the egg-laying females) is dark green. The oviparous female is dark purplish green. The male has its head and antennae black, its thorax greenish black, its abdomen dark green with an amber area on part near the thorax. Its body is colored much like the winged female, but since the male is wingless its general appearance is strikingly different.

In size this species varies as much as it does in color, and there are thus two reasons why the species has been named and renamed. Individuals of different sizes and colors and on different plants would be easily mistaken for different species.

THE NAMES OF THE MELON APHID

Two common names, "melon aphid" and "cotton aphid" are sanctioned by the American Association of Economic Entomologists as proper popular designations for this insect.

The technical names with which it has been christened by various workers in various lands are presumably numerous. It would be difficult to ascertain just how many technical names have been bestowed upon this species, because published descriptions are not, in certain instances, sufficient to make clear what species is indicated. Although the status of many a name is in doubt, entomologists are, apparently, agreed that the names *Aphis gossypii* Glover, *Aphis malvae* Koch, *Aphis cucurbiti* Buckton, and *Aphis cucumeris* Forbes and *Aphis citrulli* Ashmead all apply to the same species. As will be noticed all these names are

indicative of the presence of the aphid on mallows or cucurbits or citrus plants. Since Glover's name is the oldest, *Aphis gossypii* has been the accepted name. Eleven years before Glover in the United States published his description of the "cotton aphid", which he called *Aphis gossypii*, however, Kaltenbach, in Germany, published a description of an aphid, found on two species of *Sedum*, which he called *Aphis sedi*. There is nothing in Kaltenbach's description to preclude his account from applying to the species under consideration; and it is not unlikely that Glover's name will, in turn, fall as a synonym, and that the melon aphid, or cotton aphid, will be known technically, in future publications, as *Aphis sedi* Kaltenbach. If such be the case, it will be quite appropriate that this aphid should bear the name of its primary food plant; although there would be a touch of humor in the circumstance that its legal name should have no reference to any of the plants in the three families associated with its economic depredations.

Control Measures

Treatment of Primary Food Plant. Orpine has proven itself a pernicious weed when escaped from gardens, and its destruction in such situations would serve two worthy agricultural ends in the eradication of a weed and the elimination of the overwintering host plant of the melon aphid. Cutting the plants in midsummer and applying salt or caustic soda is said to be effective.

In situations where eradication of the orpine is impractical or undesirable, it may be feasible to cut the stems late in the fall and burn them in order to destroy the aphid eggs.

Since the tips of infested orpine shoots become distorted, it is not difficult to locate spring and summer colonies of the melon aphid. (See figure 13). Under certain circumstances cutting and destroying such shoots would be practicable.

Treatment of Economic Food Plants. Since plants of economic importance are among those especially sought by the melon aphid in summer, only such treatments as will kill the aphids without injury to the vegetation are feasible. What treatment to use, and the time and method of application will obviously depend on the type of vegetation treated and other local con-

ditions. For cucumbers, melons, and other cucurbits, nicotine sulphate has been considered effective, either as a spray or a dust. In spraying it is necessary to use a nozzle attached to an up-turned spray rod in order to hit the underside of the leaves. A wheel-barrow type of spray pump or a knapsack duster will be sufficient equipment for small fields. Large fields can be treated to better advantage with power machinery.

Treatment of Greenhouse Plants. The melon aphid can thrive on greenhouse or house plants and disperse to field crops. It would be a good practice to see that such infested plants are fumigated during the winter, thus eliminating house colonies of the pest.

APHIDS ATTACKING PLANTS OF THE GOURD FAMILY

Aphis gossypii, known as the "melon aphid" is not the only member of this family of insects to feed upon melons and related plants. Aphids under about 17 names have been recorded from melons or other plants belonging to the same family. Due to synonomy and other reasons, fewer than half of these names are at present interpreted as having any status in connection with plants of the family under consideration. The key will serve easily to indicate these; and the comments accompanying the list that follows interpret the status of the aphids, as understood by the writer.

KEY

1. Aphids feeding on the roots.....*Aphis maidiradicis*
   Aphids on parts of plants above ground.....2
2. With prominent antennal tubercles. Cornicles long.....3
   Without prominent antennal tubercles.....4
3. Antennal tubercles converging. Cornicles swollen.....*Myzus persicae*
   Antennal tubercles diverging. Cornicles cylindrical
   .....*Macrosiphum solanifolii*
   M. cyparissiae var. cucurbitae
4. Both wingless and winged forms with black cornicles.....5
   Cornicles of wingless females pale to dusky, never black.
   .....*Aphis abbreviata*
5. Cauda typically with 3 pairs of lateral hairs (frequently with but 2 pairs).....*Aphis gossypii*
   Cauda with as many as 4 or 5 pairs of hairs.....*Aphis rumicis*

List

abbreviata Patch, *Aphis.* Patch, Edith M., 1924. The Buckthorn Aphid. Me. Agr. Exp. Sta. Bul. 317. This species is frequently found on cucumbers and squashes.

ascita Walker, *Aphis.* Walker, Francis, 1852. Cat. Hom., Brit. Mus. 4: 1045. Walker recorded this aphid from the leaves of melon and cucumber; but it is not now known to what species the name was applied.

cucumeris Forbes, *Aphis.* A synonym of *A. gossypii.*

cucurbitae (Middleton), *Macrosiphum.* This name antedates that of *Macrosiphum solanifolii* Ashmead and undoubtedly refers to the same species. But until the synonomy of this aphid is finally worked out, there would be nothing gained in changing from the name by which this insect is best known in economic literature.

cucurbiti Buckton, *Aphis.* A synonym of *A. gossypii.*

cyparissiae Koch var. *cucurbitae* Del Guercio, *Macrosiphum.* Del Guercio, Giacomo, 1913. Generi e Specie Nuove di Afididi. Redia. 10:194. ".....investiendo le Zucche, i Cetrioli, i Poponi, ed i Melloni..... *(Ecballion elaterium).*

gossypii Glover, *Aphis.* See page 192 of the present bulletin for a brief discussion of the synonomy of this species.

illata, Walker, *Aphis.* Walker, Francis, 1849. Zoologist 7, App. 43. This species was recorded by Walker on vegetable marrow. Like *Aphis ascita* it is considered a "lost species."

lactucae (Kaltenbach) *Rhopalosiphum.* This species has been recorded from *Cucurbita Pepo* L. Wilson, H. F. and Vickery, R. A., 1918. A Species List of the Aphididae of the World. Trans. Wisc. Acad. Sci. 19:228. Since, however, it is known to migrate between *Ribes* (currant) and certain plants of the Composite Family, its presence on cucurbits was probably accidently.

maidiradicis Forbes, *Aphis.* Vickery, R. A., 1910. Contributions to a Knowledge of the Corn Root Aphis. U.S.D.A. Bur. Ent., Bul. 85, Pt. VI:111.

malvaccarum Goot, *Aphis. (A. malvoides* Das.) Goot, van der, 1918. Footnote to The Aphididae of Lahore. Mem. Ind. Mus. 6, No. 4. "I have some doubt that this species may only be a small variety of the polyphagus *Aphis gossypii* Glover."

papaveris Fabricius, *Aphis.* A synonym of *A. rumicis.*

persicae (Sulzer), *Myzus.* Various members of the Gourd Family are frequently infested by this aphid.

rumicis Linne *Aphis*. This black aphid of wide distribution is common on members of the Gourd Family. Davidson, J. 1914. The Host Plants and Habits of Aphis Rumicis. Ann. Appl. Biol. 1:118, and subsequent papers. Horsfall, John Louis, 1925. The Life History and Bionomics of Aphis Rumicis. Univ. Iowa Stud. n.s. No. 87.

solanifolii (Ashmead), *Macrosiphum*. Patch, Edith M., 1923. Rose Bushes in Relation to Potato Culture. Me. Agr. Exp. Sta. Bul. 303; 1925. Potato Aphids. Me. Agr. Exp. Sta. 323:10.

symphiti Schrank, *Aphis*. Passerini, G., 1963. Flora degli Afidi Italiani: 40. It is not known to the writer what this species is.

———— Sanborn. *Macrosiphum*. Sanborn, Charles E., 1904. Kansas Aphididae. Kans. Univ. Sci. Bul. 3:80, Pl. xxi. This species, recorded without a name, is *M. solanifolii*.

Fig. 13. Orpine with tips of stalks distorted by spring colonies of *Aphis gossypii.*

FIG. 14. Cucumber with leaf at right distorted by *Aphis gossypii*, the colony being composed of descendants of aphids experimentally transferred from orpine.

FIG. 15. Fall forms of *Aphis gossypii* on orpine. The forms present are dark wingless females and their progeny (egg-laying females and wingless males).